Jeff Moore

Landscape Evolution of Titan

Titan may have acquired its massive atmosphere relatively recently in solar system history. The warming sun may have been key to generating Titan's atmosphere over time, starting from a thin atmosphere with condensed surface volatiles like Triton, with increased luminosity releasing methane, and then large amounts of nitrogen (perhaps suddenly), into the atmosphere This thick atmosphere, initially with much more methane than at present, resulted in global fluvial erosion that has over time retreated towards the poles with the removal of methane from the atmosphere. Basement rock, as manifested by bright, rough, ridges, scarps, crenulated blocks, or aligned massifs, mostly appears within 30° of the equator. This landscape was intensely eroded by fluvial processes as evidenced by numerous valley systems, fan-like depositional features and regularly-spaced ridges (crenulated terrain). Much of this bedrock landscape, however, is mantled by dunes, suggesting that fluvial erosion no longer dominates in equatorial regions. High mid-latitude regions on Titan exhibit dissected sedimentary plains at a number of localities, suggesting deposition (perhaps by sediment eroded from equatorial regions) followed by erosion. The polar regions are mainly dominated by deposits of fluvial and lacustrine sediment. Fluvial processes are active in polar areas as evidenced by alkane lakes and occasional cloud cover.